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PEPPERMINT.

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PEPPERMINT.[a]

DESCRIPTION.

One of the most important essential oils produced in the United States is distilled from the peppermint plant and its varieties. The three kinds of mint grown in this country for the distillation of peppermint oil are the so-called American mint (*Mentha piperita* L.), the black mint (*Mentha piperita vulgaris* Sole), and the white mint (*Mentha piperita officinalis* Sole), the two last named being varieties of the American mint.

The American mint, although introduced from England many years ago, is so called from the fact that it has long been cultivated in this country, and the name "State mint" has been applied to it in the State of New York for the same reason.

The peppermint, or American mint, is now naturalized in many parts of the eastern United States, occurring in wet soil from the New England States to Minnesota, south to Florida and Tennessee. It is an aromatic perennial belonging to the mint family (Menthaceæ), and propagates by means of its long, running roots (fig. 1). The smooth, square stems are erect and branching, from 1 to 3 feet in height, bearing dark-green, lance-shaped leaves, which are from 1 to 2 inches long, and from one-half to 1 inch wide. The leaves are pointed at the apex, rounded or narrowed at the base, sharply toothed, smooth on both sides, or with hairy veins on the lower surface. The flowers are borne in whorls in dense, terminal spikes; they are purplish, with a tubular, five-toothed calyx, and a four-lobed corolla. (Fig. 2.)

[a] In response to a steady demand for information relating to the peppermint industry, Miss Alice Henkel, Assistant in Drug-Plant Investigations, has been requested to bring together the most important facts regarding the history, culture, and utilization of the peppermint plant. The information here presented has been obtained in large part from scattered articles on the subject, and in part from experience with the plant in the Testing Gardens of the Department of Agriculture.

RODNEY H. TRUE, *Physiologist in Charge.*

OFFICE OF DRUG-PLANT INVESTIGATIONS,
Washington, D. C., October 14, 1905.

The two varieties mentioned are closely related botanically, although in general appearance they are quite different. The variety known as black mint (*Mentha piperita vulgaris*) has purple stems and slightly toothed, dark-green leaves, while the white mint (*Mentha piperita officinalis*) has green stems, with brighter green leaves, which are more lance-shaped and more deeply toothed. Black mint is much more hardy and productive than either the American mint or the white mint, and is grown on nearly all peppermint farms in this country. The white mint, which produces a fine grade of oil, is rarely cultivated on a commercial scale in this country on account of its inability to withstand the climate and its smaller yield of essential oil.

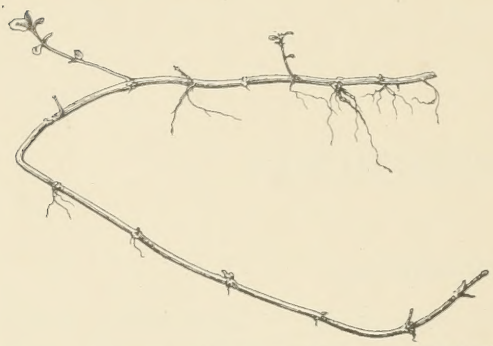

FIG. 1.—Peppermint "runners," showing method of propagation.

The oils spoken of as Japanese and Chinese "peppermint" oils are not obtained from the true peppermint plant, but are distilled from entirely different species, namely, *Mentha arvensis piperascens* Malinvaud and *Mentha arvensis glabrata* Holmes, respectively.

COUNTRIES WHERE GROWN.

The most important peppermint-producing countries are the United States, England, and Japan. Peppermint is grown on a smaller scale in Germany, France, Italy, Russia, China, and southern India.

In Japan, peppermint cultivation is said to have been undertaken before the Christian era. The plant grown there is not, as already stated, the peppermint cultivated in our country, but *Mentha arvensis piperascens*, which is entirely dis-

FIG. 2.—Leaves and flowering top of peppermint.

tinct from the true peppermint, not only botanically but also in taste and odor.

Peppermint is cultivated on many drug farms in England, especially at Mitcham, the middle of the eighteenth century marking the beginning of peppermint cultivation in that country. Up to 1805, however, there were no stills at Mitcham, and the crops obtained there were sent to London for distillation. About 1850, at which time the peppermint industry in England was at its height, the effect of American competition began to be felt, and caused a decided check in the production.

PEPPERMINT CULTIVATION IN THE UNITED STATES.

Wayne County, N. Y., in 1816, was the first locality in this country to distill peppermint on a commercial scale. The supply of root-stocks was obtained from the wild plants found growing along the banks of streams and brooks. Adjacent counties soon undertook the cultivation of peppermint, but Wayne County was then, and is now, the principal peppermint district in New York.

The cultivation of peppermint was extended to Ashtabula, Geauga, and Cuyahoga counties in Ohio, and also to northern Indiana. Roots were taken from Ohio into St. Joseph County, Mich., the first plantation being made on Pigeon prairie in 1835. Other plantations in St. Joseph County were established the following years, and adjoining counties soon took up the cultivation of peppermint, and southwestern Michigan has been for thirty-five years or more the greatest peppermint-producing section in the United States.

About 1844 an interesting peppermint-oil monopoly[a] was undertaken by a New York firm, which seems to have put an end to peppermint cultivation in Ohio, for none of the counties just mentioned has since been heard from as a peppermint-producing section.

The first step taken by this New York firm in its efforts to control the peppermint-oil market was to send a representative to Liverpool, England, to ascertain the amount annually demanded by that market, which was found to be about 12,000 pounds. This done, another agent was sent West to determine the amount produced annually, with the result that it was found that the farms in New York did not produce enough oil for their purposes, the plantations in Ohio too much, while those in Michigan seemed to produce just about the right amount to satisfy the Liverpool demand. A contract was then entered into by this agent with the producers in New York and Ohio "whereby he bound them under heavy penalties to plow up their mint fields and destroy the roots, and not plant any more mint, or sell or give away any roots, or produce or sell any mint oil for the

[a] Proc. Amer. Pharm. Assoc., 7: 449–459 (1858).

period of five years." For this wholesale destruction of their mint fields the producers received a bonus of $1.50 per acre. Next a contract was made by the agent with the producers of St. Joseph County, Mich., agreeing to pay them $2.50 a pound for their mint oil, every ounce of the mint oil to be delivered for a period of five years to the agents named in the contract. They also were prohibited during this period from extending their plantations and from selling roots to anyone. The producers held to these contracts for about three years, after which period the New York firm was not so anxious to enforce them, having, in the meantime, acquired a large fortune through its peppermint-oil monopoly.

Since that period the area devoted to peppermint cultivation in Michigan has steadily increased, and northern Indiana, with its principal centers of production in St. Joseph, Steuben, and La Grange counties, continues to place on the market a considerable quantity of oil. Ohio seems to have abandoned peppermint cultivation, at least on a commercial scale, and New York, for a number of years and until very recently, had greatly reduced the area under peppermint, thousands of acres formerly devoted to this crop having been given over to sugar beets, onions, and celery. In 1889 Wayne County, N. Y., had 3,325 acres of peppermint, whereas in 1899 there were only 300 acres. In 1905, about 933 acres were under cultivation.

Special canvassers appointed by the State of Michigan[a] made a canvass of 299 growers in the peppermint district in that State, covering 39 townships in nine counties (Allegan, Berrien, Branch, Cass, Kalamazoo, Oakland, St. Joseph, St. Clair, and Van Buren), and the total number of acres under peppermint cultivation, the number of pounds of oil distilled, and the average number of pounds per acre, as ascertained by this canvass, for the years 1900, 1901, and 1902, are as follows:

Items.	1900.	1901.	1902.
Total number of acres grown	2,112	2,782¼	6,400¾
Total number of pounds distilled	47,628¼	63,718¾	82,420¼
Average number of pounds per acre	22.5	23.9	12.8

CULTIVATION.

Peppermint cultivation is most profitable on muck lands, such as are now used in Michigan for this crop and for celery and cranberry culture. These muck lands were formerly marshes and swamps, which have been reclaimed by draining, plowing, and cultivating, the swamp vegetation having been thus subdued, and the decayed

[a] Twentieth Annual Report of the Bureau of Labor of the State of Michigan, 1903, pp. 438–447.

vegetable matter resulting in a very black soil which is most admirably adapted to mint cultivation. Formerly peppermint was grown exclusively on upland soil in Michigan, but it is a very exhausting crop on such land. Only two crops can be obtained from upland plantations, and after the second year's harvest the land is plowed and a rotation of clover, corn, etc., is practiced for five years before peppermint is again planted. But on the rich muck land peppermint can be grown year after year for six or seven years, the land being plowed up after each crop is harvested, and the runners turned under to form a new growth the succeeding year. The ground is harrowed in autumn and again in spring, and carefully weeded. Peppermint will grow, however, on any land that will produce good crops of corn, the ground being prepared by deep plowing and harrowing.

In Michigan[a] the land is plowed in the autumn, and early in spring it is harrowed and marked with furrows about 3 feet apart. The roots selected for planting are from one-eighth to one-quarter of an inch thick, and from 1 to 3 feet long; and the workmen engaged in "setting mint," as the process is called, carry these roots in sacks across their shoulders and place them in the furrows by hand, covering the roots with one foot and stepping on them with the other. The roots are planted so close together in the furrow as to form a continuous line. An expert workman can plant about an acre in a day.

In about two weeks the young plants will make their appearance, and are carefully hoed and cultivated until July and August, when the plants have usually sent out so many runners as to make further cultivation difficult. The crop is cultivated with horse cultivators, but if the land was very weedy in the first place, the weeds will have to be pulled by hand. It is very necessary that the land be free from weeds, as any collected with the peppermint crop will seriously injure the quality of the oil.

It may be interesting to note here that on muck lands, when necessary, the horses are usually provided with mud shoes to prevent their sinking into the soft, wet ground, these mud shoes consisting of wide pieces of iron or wood about 9 by 10 inches, fastened to the hoofs and ordinary shoes by means of bolts and straps.

CONDITIONS INJURIOUS TO CROP.

Cold and wet weather or extremely dry periods have a very unfavorable effect on the mint crop. Insect enemies also tend to cut down the mint harvest—grasshoppers, crickets, and cutworms sometimes doing considerable damage. A rust, causing the foliage to drop off

[a] Twentieth Annual Report of the Bureau of Labor of the State of Michigan, 1903, pp. 438–447.

and leaving the stems almost bare, is apt to follow if very moist weather occurs toward the latter part of the season. Weeds are especially to be avoided in a mint field, since, as stated, the quality of the oil will be seriously impaired if these are harvested with the peppermint. The weeds generally found in a peppermint field are Canada fleabane (*Leptilon canadense*), fireweed (*Erechtites hieracifolia*), giant ragweed (*Ambrosia trifida*), pennyroyal (*Hedeoma pulegioides*), Eaton's grass (*Eatonia pennsylvanica*), June grass (*Poa pratensis*), and other low grasses.

HARVESTING AND DISTILLATION.

The first crop of mint is harvested in the latter part of August, when the plants are in full flower, and the gathering continues until about the middle of September, the stills running night and day until all the mint is disposed of. The first crop is usually cut with a scythe, as mowing machines do not work well on soft cultivated land. The succeeding crops are cut with a mowing machine or sweep-rake reaper. The highest yield per acre and the best quality of oil are obtained from the first year's crop. Sometimes, if the weather conditions have been very favorable, a second cutting is made. The yield of oil from peppermint obtained from the same field sometimes varies very much, the condition of the atmosphere seeming to exert an influence upon it, as it is said that mint cut after a warm and humid night will yield more oil than that cut after a cool and dry night. It requires about 330 pounds of dried peppermint to produce 1 pound of oil, and the yield of oil from an acre ranges from 12 to 50 pounds.

If the mint crop has been grown on muck land, all that is necessary after the crop has been harvested is to plow up the land and turn the runners under for a new crop. If grown on upland, after the second year's crop is in, or, at the most, after the third year's harvest, the land is plowed and then given up to other crops. Peppermint exhausts the land, and it is necessary to practice rotation of crops for about five years in order to put the land in condition if it is desired to use it again for peppermint cultivation.

After the plants are cut they are usually placed in windrows until they are dried, but are not allowed to become so dry as to permit the leaves to shatter off, and are then taken to the distillery. Some growers believe that if the plants are allowed to dry there will be a smaller oil content owing to the escape of some of the oil into the atmosphere, and so have the plants brought to the distillery in the green state; but Mr. A. M. Todd[a] is of the opinion that no loss of oil will result

[a] Amer. Jour. Pharm., 60: 328–332 (1888).

from drying, his experiments along this line showing that the dry plants can be distilled three times as rapidly as the green plants, and that a larger quantity of oil may be obtained. He states that—

> To obtain the best results, both as to quality of essential oil and economy of transportation and distillation, the plants should be dried as thoroughly as possible without endangering the loss of the leaves in handling. Distillation should then take place as soon as convenient to prevent the oxidation of the oil in the leaf by atmospheric action.

The smaller producers, who have no stills of their own, have their mint crop hauled to the nearest peppermint distillery, where it is distilled for them at a cost of 25 cents per pound of oil.

DESCRIPTION OF STILL.

The apparatus used in peppermint distillation in the early years of the industry in this country consisted of a copper kettle, from the top of which a pipe connected with a condensing "worm." Water was placed in the kettle and the plants were immersed in it, and direct heat was applied to the bottom from a furnace. With such a still only about 15 pounds of oil could be obtained from a charge. In 1846, large wooden vats were substituted for the copper kettles, and the plants were distilled by steam passing through them. The kettle formerly used as the still was now employed to generate steam, a long pipe conveying the steam to the bottom of the vats. With this method of distillation from 75 to 100 pounds of oil could be obtained from a charge without much additional expense.

A modern peppermint still (fig. 3) may be briefly described as follows: The apparatus required consists of a boiler, a pair of large circular wooden vats, a condenser, and a receiver. The boiler, of course, is used for the generation of steam.

Two wooden vats are used in order that they may be filled and emptied alternately. These vats are about 6 feet high and about 5 feet in diameter, with tight-fitting removable covers and perforated false bottoms. Steam pipes are led from the boiler into the bottom of the vats.

The condenser consists of a series of pipes of block tin, either immersed in tanks of cold water or over which cold water is kept running, the condenser being connected with the top of the distilling vats. The condensed steam, together with the oil, flows into a metallic receiver, in which the oil, being lighter than the water, rises to the top and can be drawn off.

The perforated false bottoms with which the vats are supplied permit the passage of steam. A strong iron hoop is placed about this false bottom, and two pairs of stout chains, which meet at the top

of the vat in a pair of rings, are attached to it. After the charge has been distilled it is drawn from the vats by means of this arrangement.

The plants are thrown into the vats and are closely packed by two or three men tramping upon them, and as the vat becomes about one-third full the packing is still further assisted by turning in a small supply of steam, which softens the plants. When the vat is filled the tight cover is replaced and a full head of steam turned on. In the largest distilleries the vats have a capacity of from 2,000 to 3,000 pounds of dried plants each.

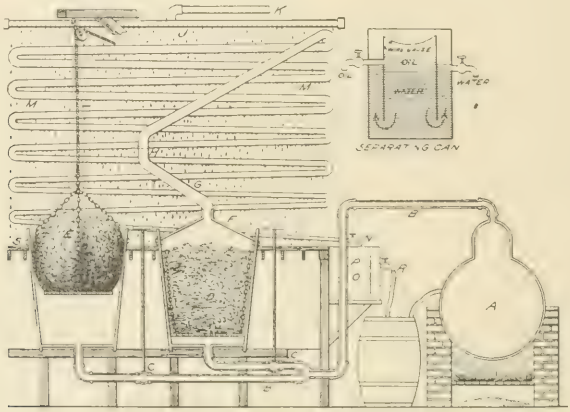

FIG. 3.—Peppermint still. (After Dewey, in Bailey's Cyclopedia of American Horticulture.)

A, boiler; *B*, steam pipes leading to vats; *C*, valves for shutting off steam; *D*, mint packed in vat ready for distilling; *E*, mint being lowered into vat; *F*, tight-fitting cover used alternately for both vats; *G*, pipe from top of vat, joined at *H* so as to swing to other vat; *J*, perforated pipe, from which cold water drops over condensing tubes; *K*, supply pipe for cold water; *M*, condensing pipes; *N*, outlet for condensed oil and water; *O* and *P*, water and oil in separating can; *R*, outlet for water; *S*, floor of distilling room.

Large tanks are used for storing the oil, and cans holding 20 pounds each are employed for shipping, three of these cans being placed in a wooden case.

The peppermint hay which remains after distillation is used as a fertilizer or is fed to stock.

PEPPERMINT OIL AND MENTHOL.

Peppermint leaves and flowering tops are official in the Eighth Decennial Revision of the United States Pharmacopœia, as are likewise the following products and preparations derived from these parts: Oil of peppermint, menthol, spirit of peppermint, and peppermint water.

The United States Pharmacopœia describes oil of peppermint as "a colorless liquid, having the characteristic strong odor of peppermint and a strongly aromatic pungent taste, followed by a sensation of cold when air is drawn into the mouth." It is largely used in medicine, internally as a stimulant and carminative, and externally to relieve neuralgic and rheumatic conditions. It is also used for flavoring and scenting confectionery, cordials, and cosmetics. There is a slight difference in the odor of white and black peppermint oil, the black being more pungent and less agreeable in fragrance than the white, which has a much finer odor, but, as already indicated, the white mint is less hardy than the black and yields a smaller quantity of oil.

The Japanese oil of peppermint, which, as pointed out elsewhere in these pages, is obtained from a different species of mint than that which produces the true oil of peppermint, is very inferior to the last named. It has a very unpleasant odor and a bitter, disagreeable taste, but it is a heavy oil and contains a higher percentage of menthol and, being a very much cheaper oil, it is liable to be used as an adulterant of true peppermint oil.

Menthol, formerly known as peppermint camphor, is the solid constituent of oil of peppermint, obtained by subjecting the distilled oil to an exceedingly low temperature by means of a freezing mixture. Its properties are about the same as those of oil of peppermint, only somewhat intensified. It is very largely made up into cones or pencils, which furnish a popular remedy, to be applied externally or inhaled, for the relief of headache, neuralgia, catarrh, asthma, and kindred affections. It is also largely employed in other forms of medication. The name "pipmenthol" has been applied to the menthol obtained from the American oil, to distinguish it from the Japanese menthol. Pipmenthol is said to have a distinct odor of peppermint, while the Japanese menthol has but a slight peppermint odor.

EXPORT OF PEPPERMINT OIL.

The exports of peppermint oil during the fiscal year ended June 30, 1904, amounted to 42,939 pounds, valued at $124,728. Germany and the United Kingdom were the largest consumers, the former receiving 22,372 pounds, valued at $65,505, and the latter 11,558 pounds, worth $31,798.

The following tables show the export of peppermint oil, by countries, for the fiscal year ended June 30, 1904, and the quantities and values of peppermint oil exported for a period of ten years, from July 1, 1894, to June 30, 1904, inclusive:

Exports of peppermint oil, by countries, for the fiscal year ended June 30, 1904.[a]

Country.	Quantity.	Value.
	Pounds.	
Belgium	473	$1,585
France	3,054	10,059
Germany	22,372	65,505
Italy	826	2,471
Netherlands	590	1,934
United Kingdom	11,558	31,798
Dominion of Canada:		
Nova Scotia, New Brunswick, etc	85	234
Quebec, Ontario, Manitoba, etc	1,165	3,306
Newfoundland and Labrador	94	204
West Indies:		
British	183	700
Cuba	29	87
Danish	17	55
Dutch	20	61
Argentina	1,237	3,504
British Guiana	10	31
Peru	50	175
British Australasia	1,176	3,019
Total	42,939	124,728

[a] The Foreign Commerce and Navigation of the United States for the year ending June 30, 1904, vol. 1, p. 531, Bureau of Statistics, Department of Commerce and Labor.

Quantities and values of peppermint oil exported during the fiscal years 1895 to 1904, inclusive.[a]

Fiscal year.	Quantity.	Value.	Fiscal year.	Quantity.	Value.
	Pounds.			*Pounds.*	
1895	87,633	$194,616	1900	89,558	$90,298
1896	85,290	174,810	1901	60,166	63,672
1897	162,492	257,484	1902	36,301	54,898
1898	145,375	180,811	1903	13,033	34,943
1899	117,462	118,227	1904	42,939	124,728

[a] From The Foreign Commerce and Navigation of the United States for the year ending June 30, 1902, vol. 2, p. 309, Bureau of Statistics, Treasury Department; and The Foreign Commerce and Navigation of the United States for the year ending June 30, 1904, vol. 1, p. 192, Bureau of Statistics, Department of Commerce and Labor.

PRICES OF PEPPERMINT OIL.

The price of peppermint oil was very low for a few years prior to 1900, the enormous production of 1897 resulting in a great drop in price. The lowest price paid for it was in 1899, when it brought only 75 cents per pound. As a result of the low price a great many mint farmers restricted the area of their mint plantations or altogether abandoned peppermint cultivation. The smaller output of the following seasons again sent prices up, and in 1902 the oil sold as high as $4.75 a pound, which price was maintained until early in 1903, when it gradually declined, until toward the end of that year it reached $2.20 per pound.

The following table[a] gives the highest and lowest prices of peppermint oil in bulk from 1873 to September 16, 1905:

Year.	Highest.	Lowest.	Year.	Highest.	Lowest.	Year.	Highest.	Lowest.
1873	$3.15	$3.15	1884	$3.00	$2.50	1895	$2.00	$1.70
1874	5.25	3.75	1885	4.37	2.75	1896	1.85	1.20
1875	5.50	3.20	1886	3.60	2.75	1897	1.25	.90
1876	3.75	2.40	1887	2.75	1.90	1898	.90	.80
1877	3.00	1.75	1888	2.40	1.75	1899	.90	.75
1878	2.00	1.50	1889	2.30	1.80	1900	1.10	.80
1879	2.65	1.45	1890	2.40	1.80	1901	1.80	1.10
1880	2.87	2.60	1891	2.50	2.45	1902	4.75	1.70
1881	2.85	2.35	1892	2.50	2.15	1903	4.75	2.20
1882	2.50	2.25	1893	2.45	2.15	1904	3.75	2.65
1883	2.60	2.20	1894	2.45	1.70	1905*	3.45	2.25

* To September 16.

The good prices of the past few years have caused many farmers to look again to peppermint as a profitable crop, as noted in increased areas under cultivation in many localities. This is the case not only in Michigan and Indiana, but also in New York, where for many years the peppermint industry has been declining. Thus, if favorable conditions of growth prevail, an increased production may be looked for within the next few years, which will have the effect of again depressing prices.

As is the case with other products the prices of which are subject to great fluctuations, the condition of the market for peppermint oil needs to be closely observed. The cost of cultivation per acre has been stated at from $12 to $14, and, with a charge of 25 cents per pound of oil for distillation, the market price may easily fall below the cost of production.

[a] From Oil, Paint, and Drug Reporter, September 18, 1905, p. 7.

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